Surgical versus Non-surgical Management of Obstructive Sleep-Disordered Breathing in Children: Meta-Analysis

For Partial Fulfillment of Master degree in Family Medicine

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Alaa Ahmed

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List of Abbreviations

Abb.	Full term

AHI .....*Apnea–Hypopnea Index*
CAS 15.....*Clinical Assessment score*
CBCL.....*Child Behavior Checklist*
CPAP .....*Continuous Positive Airway Pressure*
FEM .....*Fixed-Effects Method*
K.....*Number of Studies Included in the Review*
MSLT .....*Multiple Sleep Latency Test*
N.....*Number of Studies not Considered and with Null Results*
NEPSY..... *Neuropsychological Assessment*
NS .....*Non-Surgical*
OR .....*Odds Ratio*
OSA.....*obstructive sleep apnea*
OSA-18..... *Obstructive Sleep Apnea-18*
OSAS .....*Obstructive Sleep Apnea Syndrome*
OSDB .....*Obstructive Sleep-Disordered Breathing*
PSG .....*Polysomnogram*
QOL .....*Quality Of Life*
RCT.....*randomized controlled trial*
REM .....*Random-Effects Method*
RR.....*Relative Risk*
S .....*Surgical*
SE .....*Standard Error*
SMD .....*Standardized Mean Difference*
SRBD.....*Sleep Related Breathing Disorders*
T & A .....*Tonsillectomy & Adenoidectomy*
W.....*Weight of the Study*
WASI.....*Weschler Abbreviated Scale of Intelligence*

Abstract

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Abstract

Background: Obstructive sleep disordered breathing (OSDB) includes a wide spectrum of clinical entities with variable severity of recurrent partial or complete upper airway obstruction. OSDB is common in children, adenotonsillar hypertrophy account for most cases in children. Adenotonsillectomy is widely considered an effective treatment for obstructive sleep disordered breathing in children. **Objectives:** To compare effectiveness of surgical versus non-surgical treatment of Obstructive sleep-disordered breathing in children in randomized controlled trials through a meta-analysis study. **Search methods:** The Cochrane Central Register of Controlled Trials, PubMed, EMBASE, Google Scholar, Web of Science, were searched for available trials till August 2017. **Selection criteria:** Clinical trials concerned in treatment of Obstructive sleep-disordered breathing in children aged 2 to 16 years. **Outcome measured:** Apnea/Hypopnea Index, behavioral outcomes, neurocognitive performance, executive functions, health care utilization, disease specific quality of life and adverse events of treatment. **Results**: Seven trials met the inclusion criteria. As regard disease-specific quality of life Four studies evaluated this outcome there was significant clinical improvement in the surgical group (REM: SMD = -1.013, 95% CI = -1.584 to -0.441, P-value = 0.001), while Only one study measures health care utilization which states that Adenotonsillectomy significantly reduces health care utilization. As regard Apnea/Hypopnea Index, three studies present their data as continuous data evaluated the change in AHI among children with OSDB by pooling of these three studies there is no statistically significant difference between both management strategies surgical and non-surgical (REM: SMD = -0.248, 95% CI = -0.701 to 0.205, P-value = 0.283), Two other studies present their data as dichotomous data by pooling of these two studies there is no statistically significant difference between both management strategies (FEM: Odds ratio = 0.881, 95% CI = 0.304 to 2.557, P-value = 0.816). Regarding behavioral outcomes two studies evaluated the change in behavior by pooling of these 2 studies there was no difference between both management strategies (REM: SMD = -0.514, 95% CI = -2.145 to 1.117, P-value = 0.537). Two studies evaluated the changes in executive functions by pooling these 2 studies there was no statistically significant difference between surgical and non-surgical management (REM: SMD = 0.151, 95% CI = -0.037 to 0.340, P-value = 0.116). Two studies evaluated adverse events that occurred among children by pooling these 2 studies there was no difference between both management strategies (FEM: Odds ratio = 0.834, 95% CI = 0.317 to 2.193, P-value = 0.713). Only one study measures neurocognitive outcome, no inference on neurocognitive outcome can be elicited. **Conclusion**: the current meta-analysis reported significant clinical improvement in the surgical group as compared with the non-surgical group, in terms of disease specific quality of life, Health care utilization. However, there was no significant changes in other outcomes.

Keywords: Obstructive sleep-disordered breathing, Adenotonsillectomy, sleep apnea.

INTRODUCTION

Obstructive sleep-disordered breathing (OSDB) is a term for several chronic conditions in which partial or complete cessation of breathing occurs many times throughout the night, resulting in fatigue or daytime sleepiness that interferes with a person's functions and reduces quality of life ***(Ioachimescu and Collop, 2012).***

Obstructive sleep-disordered breathing can occur in both children and adults. It ranges in severity from simple snoring to obstructive sleep apnea syndrome (OSAS). Most children who present with OSDB are four to eight years old with different clinical symptoms at different ages. Infants often present with noisy breathing and disturbed nocturnal sleep, toddlers and preschool-aged children with snoring and mouth breathing, and school-aged children with behavioral and dental problems ***(Li and Lee, 2009).***

Obstructive sleep-disordered breathing is increasingly being recognized as a cause of morbidity even in young children. With an estimated prevalence of 1 to 4% ***(Sinha and Guilleminault, 2010).***

Obesity and adenotonsillar hypertrophy account for most cases of obstructive sleep apnea in children. however, any anomaly of the upper airway may produce intermittent obstructive symptoms during sleep. Facial, oral, and throat

abnormalities occur in many congenital syndromes. Certain storage diseases, hypothyroidism, and Down syndrome result in upper airway crowding due to a relative increase in tongue mass compared to mouth size ***(Verhulst et al., 2008).***

Obstructive sleep-disordered breathing is common in children. From 3% to 12% of children snore, while obstructive sleep apnea affects 1% to 10% of children. Complications of untreated obstructive sleep apnea include failure to thrive, enuresis, behavioral problems, attention-deficit disorder, poor academic performance, and cardiopulmonary diseases in the form of hypertension, pulmonary hypertension, and eventually cor pulmonale ***(Victor, 1999).***

Polysomnography (PSG) is the accepted standard for measuring obstructive sleep disordered breathing (OSDB) including obstructive sleep apnea in both adults and children**.** An overnight sleep study (polysomnography) is considered the most comprehensive investigation for diagnosing obstructive sleep apnea syndrome ***(Marcus et al., 2012).***

In children >1 year of age undergoing in laboratory attended PSG, an apnea–hypopnea index (AHI) >1.5 events per hour of sleep is statistically abnormal. But, the cut-off point that define clinically significant abnormalities, or level at which treatment is likely to alter outcome are yet to be determined ***(Montgomery-Downs et al., 2006).***

This test is not routinely performed in children with a suspected diagnosis of obstructive sleep apnea syndrome in many countries because of its high cost and limited availability ***(Marcus et al., 2012).*** Therefore, assessment of the severity of obstructive disordered breathing in everyday practice is usually assessed by a clinical history and examination, with or without overnight pulse oximetry ***(Brietzke et al., 2004).***

Surgical removal of the tonsils with or without removal of the adenoids, called adenotonsillectomy, is a common surgical procedure in children for treatment of obstructive sleep disordered breathing ***(Erickson et al., 2009).***

Some children with comorbidities undergoing surgery for obstructive disordered breathing are at increased risk of peri- and postoperative respiratory complications these high risk children include (cardiac and/or craniofacial abnormalities, neuromuscular disorders) or in children with severe sleep apnea (e.g. an oxygen saturation level in arterial blood of ≤ 80% or an Apnea/Hypopnea Index (AHI) > 24). The most common complication is postoperative bleeding, which may occur in up to 5% of children ***(Baugh, 2011; Lipton, 2003; Robb, 2009; Schwengel, 2009).***

There are number of alternative management strategies for children with obstructive sleep apnea, which could be considered in the absence of early surgical intervention ***(Whitla and Lennon, 2017).***

Other non-surgical management options for obstructive disordered breathing involve non-invasive ventilatory support (e.g. continuous positive air pressure (CPAP)) and reducing the effort of breathing with weight loss regimes. Recent evidence has suggested that children with OSAS have raised local and systemic inflammatory markers, which causes proliferation of lymphoid tissue within the tonsils and adenoids. intranasal and systemic corticosteroids aim to increase airway patency by reducing the inflammatory response occurring in the oropharynx ***(Kim et al., 2009).***

Leukotriene levels have also been shown to be higher in the adenotonsillar tissue of children with OSAS compared to those with tonsillitis ***(Goldbart et al., 2004).*** This is why the use of anti-leukotrienes such as montelukast has been suggested to have beneficial effects in children with obstructive sleep disordered breathing ***(Friedman and Goldman, 2011).***

Adentonsillectomy, is widely considered an effective treatment for obstructive sleep disordered breathing in children. Non-randomized and uncontrolled studies have shown improvements in objective (e.g. polysomnography) and subjective (e.g. parental reporting) measures of sleep, behavior, cognition and quality of life ***(Garetz, 2008).***

A 2009 systematic review, showed that adeno-tonsillectomy may not be curative, with only two out of three children achieving complete polysomnographic resolution ***(Friedman et al., 2009).***

Hypothesis:

Surgical treatment of Obstructive sleep-disordered breathing in children is more effective than non-surgical treatment.

Research question:

Is surgical treatment of Obstructive sleep-disordered breathing in children much more effective than non-surgical treatment?